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1963 Annual Report

ELDORADO

MINING AND REFINING LIMITED

and subsidiaries

Eldorado Aviation Limited

Northern Transportation Company Limited

ELDORADO

MINING AND REFINING LIMITED

HEAD OFFICE: 150 KENT STREET, OTTAWA, CANADA. POSTAL ADDRESS: P.O. BOX 379, OTTAWA, CANADA
GENERAL ADMINISTRATION OFFICE: PORT HOPE, ONTARIO, CANADA

Directors

W. J. Bennett W. M. Gilchrist* F. R. Hadley W. F. James*
Gordon Lawson* J. E. Sydie W. G. Thompson

*Members of Executive Committee

Officers

President: W. M. Gilchrist

Vice-President, Mining and Exploration: H. E. Lake

Vice-President, Refining: J. C. Burger

Vice-President, Administration and Finance: D. G. Scott

Secretary: R. C. Powell Treasurer: J. C. Orr

MANAGERS:

Beaverlodge Operation: A. R. Allen Refinery: R. M. Berry Research and Development: A. Thunaes

DISTRICT OFFICES

Refining and Sales: Port Hope, Ontario Beaverlodge Mine: Eldorado, Saskatchewan

Metallurgical Laboratories: Tunney's Pasture, Ottawa, Canada

Vice-President, Mining and Exploration: 10040 - 105th Street, Edmonton, Alberta

Western Purchasing and Employment Office: 10040 - 105th Street, Edmonton, Alberta

ELDORADO AVIATION LIMITED

HEAD OFFICE: 150 Kent Street, Ottawa, Canada

OPERATIONS OFFICE: No. 11 Hangar, Municipal Airport, Edmonton, Alberta

Directors

W. J. Bennett A. B. Caywood W. M. Gilchrist
H. E. Lake P. L. P. Macdonnell

Officers

President: A. B. Caywood

Secretary: R. C. Powell Treasurer: J. C. Orr

NORTHERN TRANSPORTATION COMPANY LIMITED

HEAD OFFICE: 150 Kent Street, Ottawa, Canada

OPERATIONS OFFICE: 10040 - 105th Street, Edmonton, Alberta

Directors

W. J. Bennett A. B. Caywood W. M. Gilchrist
W. B. Hunter H. E. Lake P. L. P. Macdonnell

Officers

President: W. M. Gilchrist

Vice-President: H. E. Lake

General Manager: W. B. Hunter

Secretary: R. C. Powell Treasurer: J. C. Orr

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1963 Annual Report

ELDORADO

MINING AND REFINING LIMITED

and subsidiaries

Eldorado Aviation Limited

Northern Transportation Company Limited

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President's Letter

The Honourable Mitchell Sharp,
Minister of Trade and Commerce,
Ottawa, Canada

Sir:

On behalf of the Board of Directors, and in accordance with Section 85(3) of The Financial Administration Act, I have the honour to submit the Annual Report of Eldorado Mining and Refining Limited and its subsidiary companies, Eldorado Aviation Limited and Northern Transportation Company Limited, for the year ended December 31, 1963.



W. M. GILCHRIST

The downward trend in production of uranium in Canada continued for the fourth consecutive year. In terms both of quantity and value, total industry sales in 1963 dropped to the lowest level since 1957 and were substantially less than half those of the peak year 1959. The 1963 sales of 15,216,812 pounds of uranium oxides, valued at \$139,900,175, were 11 per cent less in volume and 19.5 per cent less in value than those of 1962, which amounted to 17,080,037 pounds at \$173,682,395. For purposes of comparison, sales in 1959 had reached the record highs of 30,996,065 pounds, worth \$325,328,282.

A continuance of the decline in uranium production in Canada over the next few years is inevitable in light of the over-supply situation throughout the free world. Deliveries scheduled under existing contracts in 1964 will be about 20 per cent below those of 1963. By 1967 deliveries under the contracts will have declined to about 16 per cent of the 1963 level.

In 1958 Canada had 25 producing mines and the value of uranium output exceeded that of any other metal mined in this country. The position was maintained through 1959, but has declined steadily since then. At the end of 1963 only six uranium companies, operating seven mines and mills, remained in production. The Bicroft Division of Macassa Gold Mines Limited had closed its uranium operations during the year, having fulfilled its commitments.

Of the six companies still operating, Rio Algom Mines Limited and Eldorado are the only ones still making deliveries under the original contracts with the United States Atomic Energy Commission and the United King-

dom Atomic Energy Authority. During 1963 Denison Mines Limited and the Rio Algom Milliken Mine became eligible to participate in the Government stockpiling program. The Faraday mine of Metal Mines Limited and Stanrock Uranium Mines Limited will complete their deliveries under the 12,000-ton United Kingdom contract during 1964, and Gunnar Mining Limited has indicated that it will cease milling operations early this year and will be unable to fulfil its delivery requirements because of insufficient ore reserves. Only two companies will be in operation after 1965. Eldorado will continue in production until early 1967, and Rio Algom until the end of 1971, under contracts now in effect.

Diligent efforts have been made by Eldorado, by other companies in the industry, and by the Government, to find means by which the disruption of employment and other economic effects of the steady reduction in uranium production can be minimized. On the whole, these efforts have met with relatively small success, although some temporary relief was given in a few localized situations.

There are abundant reasons to believe that from 1970 onwards, there will be a steady resurgence in world demand for uranium and a restoration of relative prosperity in the Canadian industry. Despite the encouraging long range possibilities referred to later in this report, the prospect must be faced that mines will close and that production will dwindle to a mere trickle in comparison with that of the boom years.

The facts of the situation are clear-cut. In the late 1940's and early 1950's, the military preparedness programs of the United States, and to a lesser degree, of the United Kingdom, created an urgent demand for massive deliveries of uranium as quickly as possible. This demand was far beyond the capacity of all known sources of the element in the free world. Canada, already an important producer, was able to take advantage of the market opportunity. New mines were located and developed with phenomenal speed. Concurrently, however, much the same thing was happening in the United States, South Africa, France, Australia, and elsewhere. It became evident that uranium was far more abundant than had previously been anticipated, and by 1959 the United States Atomic Energy Commission had decided not to take up options for Canadian uranium over and above that being supplied under existing contracts. An arrangement for stretching out deliveries of uranium already under contract made possible an extension of life for the Canadian industry, which otherwise would have faced a complete cessation of operations by March, 1963.

While steadily increasing quantities are being used for

nuclear power generation, virtually all of the uranium being produced in the free world today is going into stockpiles. There is more than enough for foreseeable military requirements, which have dwindled sharply, as well as for civilian needs over the next few years.

Unlike copper, nickel, iron and other metals for which there are constantly enlarging industrial applications, uranium still has few uses. Other than for military purposes, the only known use for large quantities of uranium is for nuclear power reactors — a need that is likely to attain substantial proportions before the end of this century. In the meantime, the search goes on for other possible uses for uranium. Several avenues have been explored which offer considerable promise, but no prospective application yet discovered indicates a continuing demand for significant quantities of uranium.

On June 26, 1963, the Government announced a program of stockpiling as a means of extending employment in uranium mines in the Elliot Lake and Bancroft areas until July 1, 1964, with the hope that by then alternative sources of employment might be created in these communities. Eligible for participation in the stockpiling arrangement are the Rio Algom Milliken mine and the Denison mine in Elliot Lake, and the Faraday mine at Bancroft. These mines otherwise would have been shut down in 1963 or early 1964. At year-end, there had been no development in either community that would provide employment on anything like the scale resulting from operation of the mines.

Eldorado acted as the agent for the Government in negotiating the stockpiling contracts. These contracts will terminate on July 1, 1964, and will involve the Government in an investment of about \$24,500,000. At the end of the year Eldorado had in storage roughly 25 per cent of the total amount to be stockpiled. Eldorado's

costs of handling, sampling, assaying and storage are payable by the Government.

Canada is by no means the only country seeking ways to bridge the lean years in uranium production. The United States and South Africa have reduced output and stretched their firm contracts well into the future — the United States to the end of 1970, and South Africa until 1973.

These countries, like ourselves, are trying to maintain their uranium industries as going concerns in anticipation of renewed and accelerating demands for uranium beginning in the late 1960's or early 1970's. We may expect keen competition for the markets that will develop.

There are encouraging indications not only of more extensive use of nuclear reactors as a source of power in a number of countries of the free world, but of steady reduction in the cost of nuclear energy. The technology is advancing and large reactors are being developed which will produce nuclear power at costs comparable with those of energy from more conventional sources.

Euratom, the organization concerned with the development of atomic power in the European Common Market, published a report in late 1963 which estimated that free world uranium production and the requirement for peaceful purposes will be nearly in balance by 1970, and forecasting a probable shortage of uranium within another ten years. There had been no challenge of Euratom's prediction by year-end. Uranium requirements for power generation in the United States already seem to be slightly ahead of forecast.

Firm contracts now in effect assure that in 1970 the United States will produce 7,800 tons, South Africa 1,500 tons, and Canada 1,200 tons. How much France, the fourth major producer, will be able to provide for its

1963 ANNUAL REPORT IN BRIEF

	1963	1962
Sales	\$24,280,962	\$26,695,497
Net Income	\$ 2,782,888	\$ 4,210,354
Taxes (Federal, Provincial, and Municipal)	\$ 3,412,854	\$ 4,191,035
Dividends	\$ 2,000,000	\$ 3,000,000
Expenditures for land, buildings and equipment	\$ 594,820	\$ 738,093
Mine ore treated — Beaverlodge (tons)	544,177	563,580
U ₃ O ₈ produced — Beaverlodge (pounds)	1,855,212	1,959,788
Number of employees at end of year	776	848
Wages and salaries paid	\$ 5,669,325	\$ 5,663,706

power program out of its own resources in 1970 is not yet known.

Euratom's estimates, which some experts consider to be quite conservative, are that uranium needs in the western world will rise from about 12,000 tons of U_3O_8 in 1970 to 25,000-28,000 tons in 1975, and to 35,000-50,000 tons in 1980. Even if these forecasts are optimistic, it seems clear substantial markets for uranium will begin to develop within a very few years.

Confident of the long-term future, Eldorado is following a policy designed not only to maintain operation of its various facilities for as long as possible through the interim period, but to ensure that these facilities and the know-how behind them will be up-to-date, efficient and ready to meet the competitive challenges of the future.

It was with this end in view that arrangements were made in 1963 to stretch delivery of orange oxide to the United States Atomic Energy Commission until the end of 1966. While this move entailed a reduction in the work force at the Port Hope refinery as of the end of June, 1963, it meant that operation on a diminished scale could be carried on for a much longer period.

Concurrently, sales effort and the program of diversification have been intensified to ensure a continuing refinery operation. The market for uranium alloys and compounds is growing. Ceramic oxide, both natural and enriched, is becoming the accepted fuel for the more promising types of reactors. Eldorado appears to be obtaining a fair share of the orders for this material and the Company is striving to establish a reputation for dependability and quality because reliability will be a key competitive factor.

Research into applications of refinery processes for the production of other metals is being pressed, with encouraging results. It now seems probable that a number of metals can be produced economically from low-grade concentrates and residues that, until now, have had little value. Progress also is being made in the production of ultra-pure metals for which there are growing industrial markets throughout the western world. As a Crown corporation, Eldorado is directing its research into fields in which it does not compete with existing Canadian industries. Its researchers work with raw materials not being used by others, or concentrate on the production of items not now produced in Canada. This means, of necessity, that much of their work is confined to fields that have not been attractive to commercial enterprises heretofore, and which can be made so only by the application of new and advanced methods and systems.

The research and sales organizations work in close conjunction not only in the search for new products and in the diversification program, but in intensive studies of world uranium markets. Directly, and through its agencies abroad, the sales staff keeps in constant touch with developments throughout the free world which

offer current or prospective markets for uranium in any of its forms.

Price will be a vital factor when the upturn comes in the demand for uranium, and Eldorado is unceasing in its effort to shave costs in every area of production. Investigations carried on during 1963 led to a decision to invest more than \$1,000,000 on capital equipment for the ore treatment plant at the Beaverlodge mine. A large part of the expenditure will be returned in savings accomplished by the time present contracts are completed, and the plant will be in top operating shape for the competitive period.

Eldorado's two subsidiary companies experienced a very successful year. Northern Transportation Company Limited extended its operations along the Arctic coast, when it assumed, at the request of The Hudson's Bay Company, the freighting service which that Company had carried on for many years. Northern also pioneered a new operation in the Arctic when it delivered oil drilling equipment to the mouth of the Colville River on the Alaska coast east of Point Barrow. The Company's total tonnage increased slightly.

Eldorado Aviation Limited had a commendable performance in 1963, and the requirements of both the parent Company and of Northern Transportation were met in efficient fashion.

The financial results of Eldorado Mining and Refining Limited were, of course, influenced adversely by the continuing decline in uranium sales. Sales income, at \$24,280,962, was down by \$2,414,535 from that of 1962. Net profit of \$2,782,888 compared with \$4,210,354 in 1962.

As a Crown corporation Eldorado had paid to the Government, in dividends and on the redemption of shares, a total of \$30,740,000 by the end of 1963. In addition, Eldorado had paid or provided for Federal income taxes of \$26,890,000, \$3,600,000 in royalties to the Government of Saskatchewan, and \$2,400,000 in grants to municipalities in lieu of property taxes, for an aggregate of \$32,890,000. After these charges, the balance sheet of the Company still records a net worth of some \$51,000,000.

It is with pleasure that your Board of Directors records its gratitude for the loyalty and effort of employees of Eldorado Mining and Refining Limited and its subsidiaries, who have contributed so much to the success of the organization.

For the Directors,

W. M. Gilsburt

Ottawa, Canada
March 2, 1964

President

General Report

FOR THE YEAR ENDED DECEMBER 31, 1963

ELDORADO MINING AND REFINING LIMITED

and wholly-owned subsidiaries

Northern Transportation Company Limited

Eldorado Aviation Limited

This General Report includes comments upon the operations of Eldorado Mining and Refining Limited and its wholly-owned subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited, for the year ended December 31, 1963.

Income

Net profit for 1963 was \$2,782,888, after provision of \$2,900,000 for income tax and \$235,200 for Saskatchewan royalty, as against 1962 net earnings of \$4,210,354 after making provision for income tax of \$3,600,000 and for Saskatchewan royalty of \$302,400. The decline in net earnings was attributable to reduced sales revenue and the adverse effect of lower volume on unit costs. In 1963 the valuation of inventories was reduced by \$224,000, and expenditures on scientific research rose by \$417,900 to \$769,211.

Sales volume in 1963 of \$24,280,962 was \$2,414,535 less than in 1962. The downtrend in sales volume has been accentuated by further deferment of deliveries under the original contracts. A substantial reduction in the rate of deliveries from the Port Hope refinery went into effect in July 1963. The Beaverlodge mine has been operating on a reduced delivery schedule since 1961.

Eldorado began in October, 1962, to finance the procurement of uranium under the 12,000-ton contract with the United Kingdom. In 1962 this financing yielded \$263,956 in income, and in the full year 1963 the income rose to \$1,254,629 as the program expanded. Interest and other non-operating income of \$1,225,990 in 1963 was \$157,733 below that of 1962.

Taxes and Royalty

Although wholly-owned by the Crown, Eldorado Mining and Refining Limited is subject to the usual taxes imposed upon private companies, such as income tax,

sales tax and mining tax. While not subject to municipal property taxes as such, the Company pays grants in lieu equivalent to taxes at current rates to those municipalities in which its properties are situated. In 1963 grants to the municipalities of Edmonton, Ottawa, Port Hope and Uranium City totalled \$277,658, as compared with \$288,649 in 1962.

Federal income taxes paid or provided for since 1952, when the Company first became liable under the provisions of the Income Tax Act, have amounted to \$26,890,000. Over the years a total of \$3,600,000 has been paid to the Province of Saskatchewan as royalties. Grants in lieu of municipal property taxes have amounted to \$2,400,000. The aggregate of taxes and royalties over the years is \$32,890,000. This does not take into account a substantial amount paid in sales and other indirect taxes.

Dividends

A dividend of \$2,000,000 was paid by the Company to the Receiver General on December 6, 1963, being \$1,000,000 less than in 1962. Since the Crown acquired ownership of Eldorado Mining and Refining Limited in 1944, the total remitted to the Government in dividends and redemption of shares is \$30,740,000.

Capital Expenditures

The Company's authorized program of capital expenditures for the year totalled \$890,595. The actual expenditure of \$594,820 against this program was \$143,273 less than the expenditure on capital account in 1962.

New equipment for mining and milling at the Beaverlodge property required an outlay of \$240,366. Expenditures amounting to \$282,518 at the Port Hope refinery included the cost of storage facilities for concentrates delivered under the Government's stockpile program.

Additional laboratory and development facilities needed in connection with the Company's expanded research effort cost \$67,927.

An increased capital outlay amounting to \$1,654,528 is forecast for 1964. This program includes an entirely new grinding system at a cost of \$910,000; a plant for the production of oxygen for the leaching process; and equipment for calcining the precipitate to produce a higher grade product. Another item of note is the purchase of an automatic x-ray spectrometer which doubles the capacity of the analytical laboratory and does away with a serious bottleneck not only in continuing studies of ore and concentrate processing, but in development of new applications for the refinery systems.

Mine Operations

The output of the Beaverlodge mine in 1963 amounted to 1,855,212 pounds of U_3O_8 recovered from 544,177 tons of ore grading 0.20 per cent U_3O_8 . Costs per ton and per pound were well maintained considering the reduced level of production.

Comparative production statistics, excluding custom ore treated, are:

	Tons of Ore Treated	Pounds U_3O_8 Recovered	Average Recovery Pounds per Ton
1963	544,177	1,855,212	3.41
1962	563,580	1,959,788	3.48
1961	542,157	2,214,894	4.09
1960	625,127	2,454,400	3.93
1959	657,521	2,392,770	3.64
1958	676,354	2,507,663	3.71
1953-63 incl.	4,815,225	18,455,992	3.83

There was a marked increase in development work in 1963 to ensure the mine's future ability to maintain required production. Work completed during 1963, and cumulative figures to December 31, 1963 are shown below:

(in feet)	1963	Cumulative Total
Shaft-sinking	—	7,126
Drifting and cross-cutting	18,456	209,732
Raising	7,221	72,098
Diamond drilling (Underground)	75,708	863,062
Sludge drilling	4,697	111,473



Workmen erected this steel and frame warehouse, 80 by 300 feet in dimension, in a little more than eight weeks. Situated on a 5-acre site east of Port Hope, it is being used for storage of uranium purchased by the Government under the stockpiling program announced last June. When the program ends July 1, 1964, it is expected there will be more than \$24,000,000 worth of uranium in storage in the building.

Proved, probable and pillar ore reserves at the end of 1963 totalled 1,466,400 tons grading 0.22 per cent U_3O_8 , compared with 1,581,800 tons grading 0.23 per cent U_3O_8 at the end of 1962. These reserves are taken down to the lowest working level only. Development work for the past three years has consisted of shaft-sinking and lateral drives toward known ore bodies, and 1964 should see the opening of some of these bodies with a consequent increase in ore reserve tonnages.

Lateral development on the three new winze levels at Verna continued in 1963 and development of the ore bodies in this area is expected to begin early in 1964. At year end the extension of the 19th level East from Fay shaft was nearing the expected vertical extension of the main Fay ore body. Exploration and development continued in West Fay ore bodies with satisfactory results warranting further work. Lateral development on a number of the new levels of Fay will be continued through 1964.

Milling operations in 1963 showed a slight reduction in plant recovery, but costs were well maintained. A sampling plant was installed in the electronic ore sorter to check reject material more accurately, and studies were continued with a view to increasing the volume of reject material. Test work on methods to reduce impurities in precipitate were continued, and an installation to effect such reductions is being planned.

A great deal of test work was done in 1963 which resulted in a decision to install, in 1964, a 19-foot autogenous grinding mill which will replace, at the current milling rate, all existing surface crushing and grinding facilities. Test work also was done on the use of oxygen to replace air in the leaching process.

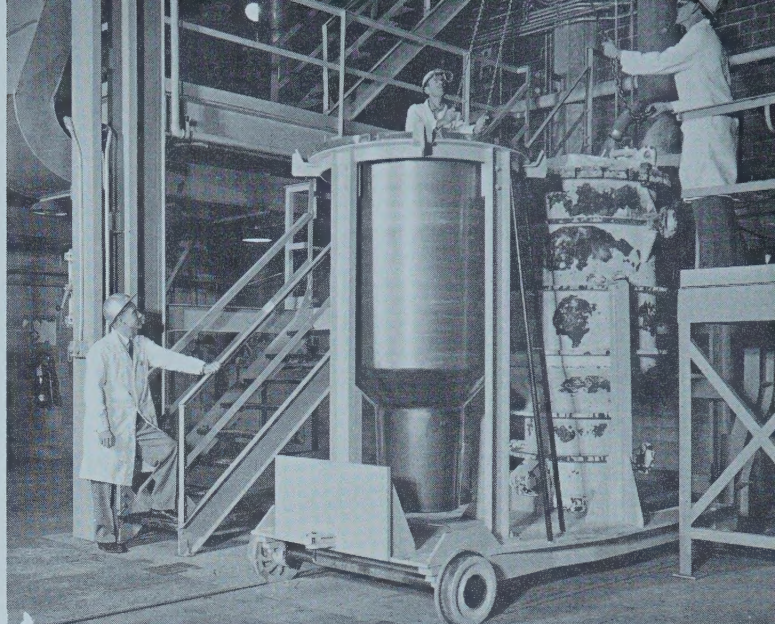
Operation of both the Waterloo Lake hydro-electric plant and the 5,000 kilowatt electric boiler was highly satisfactory, and savings as estimated were achieved.

Chief capital expenditures during the year were for additions to the transportation system and power distribution underground, improvements in the mill, and the reject sampling facilities in the ore-sorting plant. Capital expenditures planned for 1964 cover the autogenous grinding mill, a precipitate roaster for removal of impurities, and certain mill circuit automation improvements. Underground additions will include the No. 3 crusher installation, hoist automation, and other improvements.

Refinery Operations

The solvent extraction circuit was operated on a five-day-per-week maximum throughput basis until the end of June, but as of July 1 the rate of throughput was reduced to about one-quarter of maximum. This was done to stretch the orange oxide refining contract to the end of 1966.

Unfortunately, the cutback made it necessary to re-



A king-sized vessel is positioned (TOP) for filling with reactants to produce a two-ton dingot of uranium metal. (LOWER) A five-ton container of orange oxide is loaded for shipment at the Port Hope refinery.

duce the number of refinery employees from 191 to 143. The impact of this was lessened somewhat by the fact employees were given notice well in advance, and Eldorado was able by means of newspaper advertisements and contacts with other employers to assist a number of men in finding suitable jobs.

Uranium refining was suspended for a week in November so that part of the circuit might be used for processing of 58,000 pounds of residues. The run helped in the establishment of operating conditions and equipment limitations. The cobalt, nickel and uranium cake extracted from the residues was turned over to the Research and Development Division for further work.

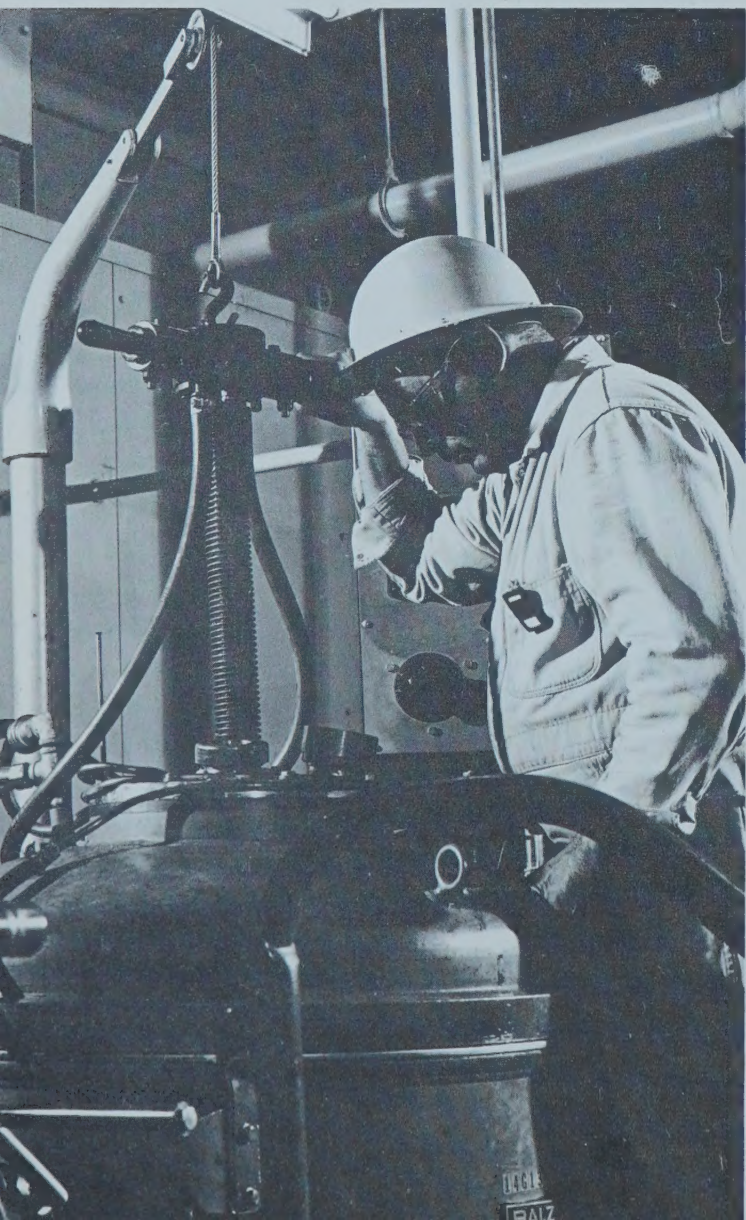
In July the Refining Division was asked to provide facilities for stockpiling concentrates to be purchased by

the Government. A five-acre site east of Port Hope was acquired and a building 80 by 300 feet in dimension was completed in October.

Deliveries of ceramic grade uranium oxide in 1963 were about 12 per cent below those in 1962. Two-thirds of the ceramic oxide produced was destined to be made into fuel elements for the CANDU reactor, and the remainder was exported to the United States. The quality continued to be excellent.

The refinery's facilities for production of high enrichments of ceramic oxide were improved by the installation of two additional circuits, and the three circuits now available are versatile enough to cope with demand over the full range of enrichment in U_{235} content. The operations are competitive in respect to production rates, quality and costs.

A number of small orders for ceramic oxide of various enrichments were processed for Atomic Energy of Canada Limited, starting with uranium hexafluoride. Two fairly large orders were processed, one for shipment to the Netherlands, the other to France.



The green salt plant was idle throughout 1963 because of the large inventory of uranium metal and the lack of significant market requirements. In the metal reduction section, a stock of depleted uranium metal was produced from depleted uranium tetrafluoride purchased from the United Kingdom Atomic Energy Authority. The depleted metal was needed for the making of special castings for radiation shielding, military purposes, and as an alloying material for the uranium-in-steel program.

Eldorado became a licensee for the Shaw casting process and by year end had made a number of test castings by this method. The refinery also made a series of enriched uranium metal — aluminum alloy billets for use in the small diameter rod extrusion program for Atomic Energy of Canada Limited.

There has been no lost-time accident in the refinery since September, 1962, and three departments have now completed ten years without a lost-time mishap.

Sales

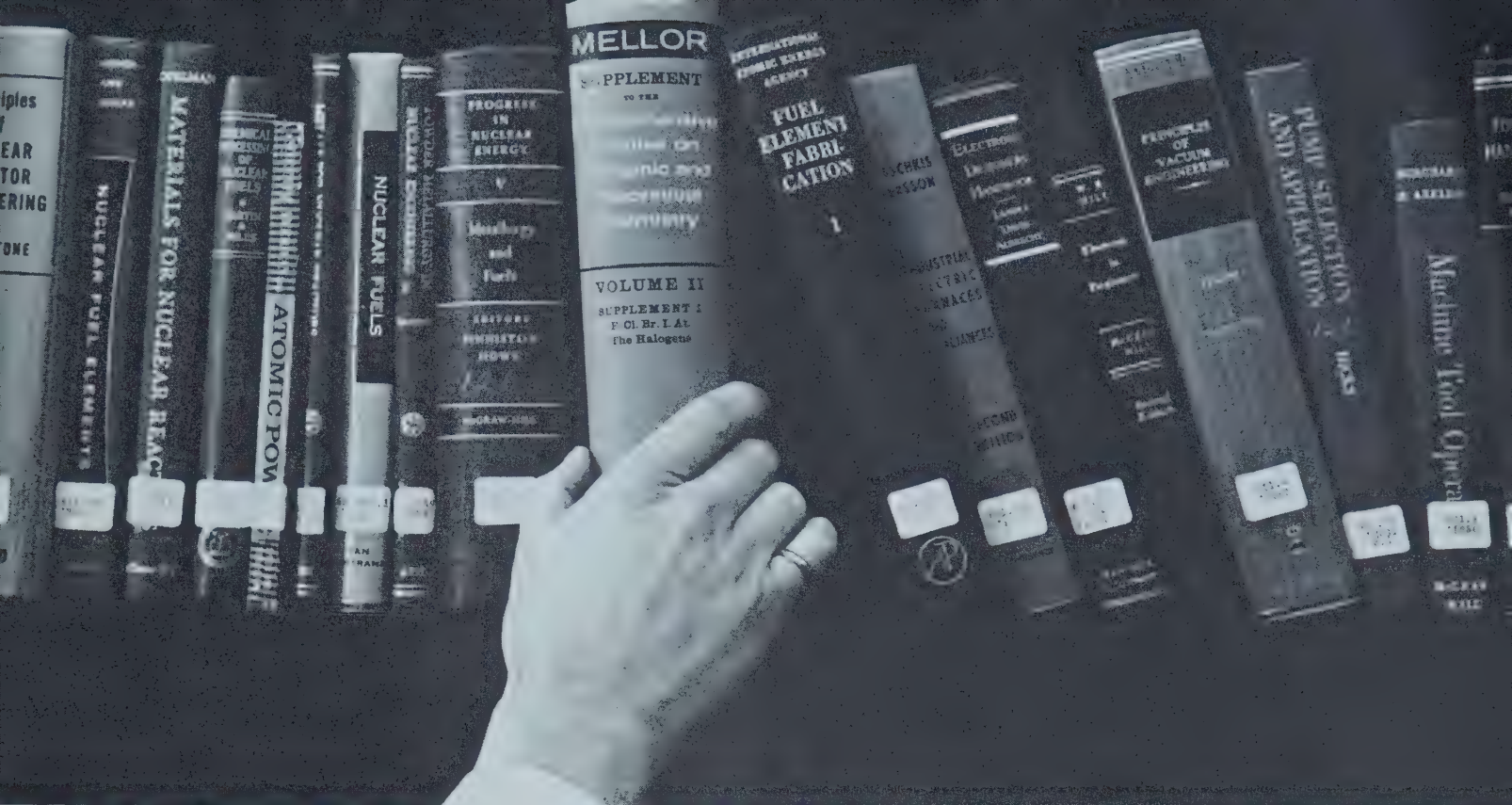
Increased effort was made in 1963 to stimulate sales. Company representatives visited several European countries and Japan, and developed new potential customers in the United States. Eldorado was represented in two major exhibitions, in Montreal and Cleveland, and enlarged its advertising and promotional activities. In addition to established products, such new products as uranium carbide and uranium-molybdenum alloy seem to have promising potentials.

Research and Development

There was a further shift in emphasis during 1963 towards research and development associated with products that could be produced at the Port Hope refinery. Much of the activity aims at use of existing refinery facilities and know-how for the production of metals and compounds not now produced in Canada, and at the treatment of raw materials that can be processed economically only by such facilities. Among the principal assets in this work are equipment and skills for solvent extraction separation of high purity compounds or metals; gas-solids reactions in moving bed columns; metal production by calcium or magnesium reduction, and an efficient nitric acid recovery system.

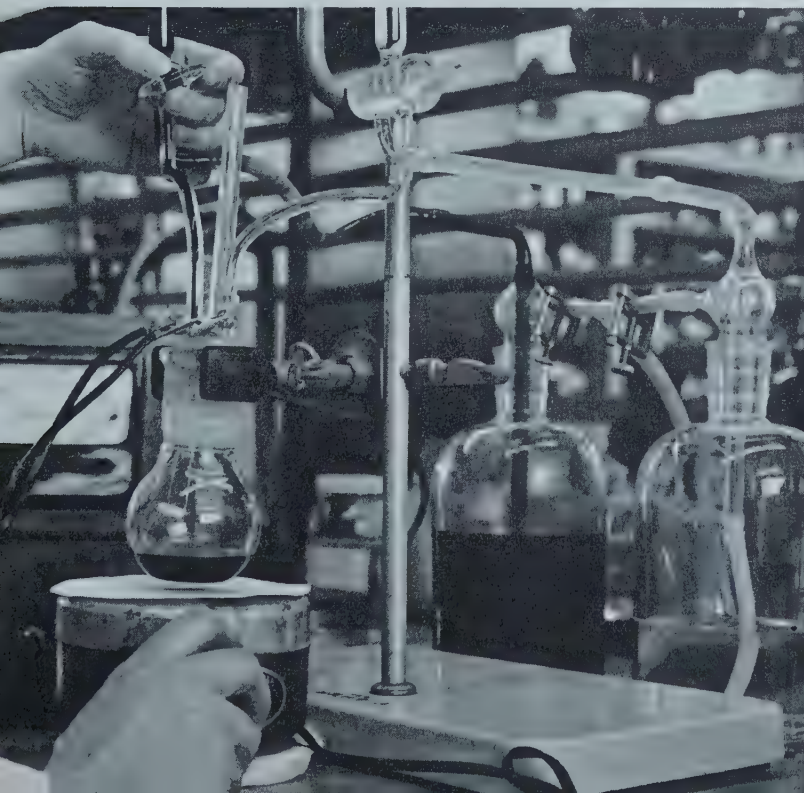
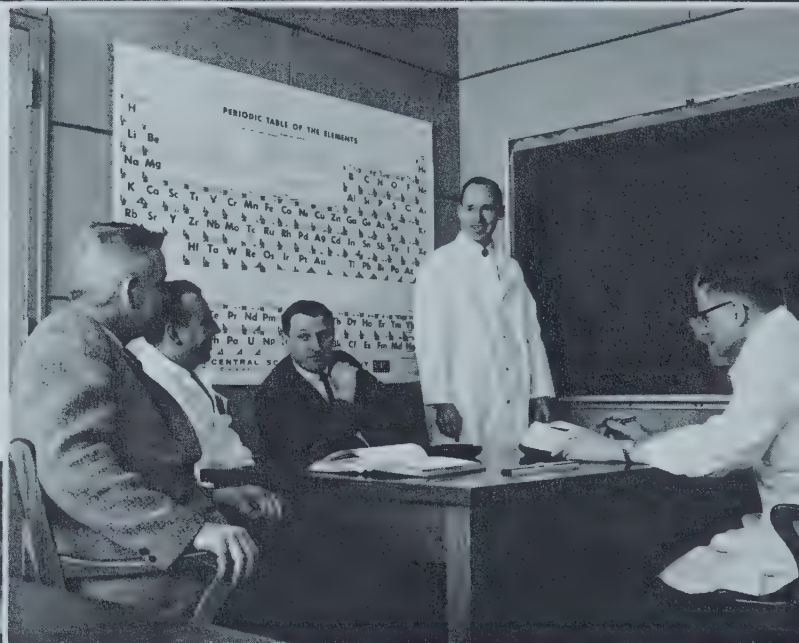
Old residues from the refinery were treated on a pilot plant basis for recovery of cobalt, nickel, copper and uranium, both to test the first part of the flow sheet developed in the laboratory and to confirm the recoverable values in the dump residue. The process appears to be economic and it is hoped that plant operation will start early in 1964. Other refractory raw materials, such as

Fantastic temperatures are reached in the arc melting and casting of uranium carbide in a vacuum furnace.



Science at Eldorado

An up-to-date library and modern, well-equipped laboratories are essential in effective scientific research, but the vital ingredient is the questing, highly-trained mind of the scientist. Eldorado's team of scientists and technicians, working in the main laboratory at Ottawa and in projects at the Refinery and the Beaverlodge Mine, concentrate not only upon development of new products, but upon better processes for the production of uranium and other metals.



complex cobalt-arsenic concentrates, can be treated by some variations of the flow sheet, and samples of these were tested by Eldorado and proved amenable to processing.

High priority is being given to zirconium-hafnium processing since Eldorado hopes to produce nuclear grade zirconium metal for an integrated Canadian zirconium industry. Processes and techniques under development in Eldorado laboratories are centred around use of such existing facilities of the Port Hope refinery as solvent extraction, nitric acid recovery system, and other uranium refining equipment. The use of existing facilities seems essential from an economic viewpoint, as there is likely to be only a moderate demand for zirconium for several years and a major capital outlay would not be justified at this time.

Work is being continued in respect to tungsten and molybdenum powders, because equipment available at the refinery seems suitable for their production. Hydro metallurgical processes have been developed for production of high purity oxides of both metals, and the moving bed technique for reduction of these oxides looks promising.

Concurrent with new product projects, the division did extensive work in 1963 in connection with uranium carbide, the enriched uranium plant, and the production of enriched uranium-aluminum billets, all in conjunction with the refinery.

Major activities having to do with the Beaverlodge mine centred around development of equipment for the calcination of precipitates, pilot plant operations on auto-genous grinding, pilot plant operation on carbonate leaching with oxygen as a replacement for air, and general process control services. Some of the development work arises from specifications for the uranium to be delivered under the United Kingdom contract, requiring reduction of the precipitate content of ionium, vanadium and carbonate.

The division made available two professional men and two technicians to assist in the uranium-steel program at the Mines Branch laboratories. Eldorado grants for university research were continued in 1963.

Ore Procurement

Sales of Canadian uranium in 1963 met all commitments to the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. The downward trend of the past three years continued. Concentrate sales under Eldorado contracts totalled 15,216,812 pounds of U_3O_8 valued at \$139,900,175, a substantial drop from 1962 figures of 17,080,037 pounds valued at \$173,682,395.

As of December 31, 1963, there remained to be delivered about eight per cent of the amount required under earlier contracts, and 84 per cent of the 12,000-ton United Kingdom contract.

At year-end Eldorado had stockpiled, for the Govern-

ment, concentrates valued at \$6,342,372. The stockpiling agreements, terminating July 1, 1964, will involve the Government in an investment of about \$24,500,000. Three mines — Milliken and Denison in Elliot Lake, and Faraday at Bancroft — are eligible under the stockpiling program. Eldorado's costs of handling, sampling, assaying and storing the concentrates are payable by the Government.

Organization and Personnel

The total work force of the Company was down from 848 at the end of 1962 to 776 at December 31, 1963, largely because of the reduction in throughput in the Port Hope refinery and the continuing improvement of operating techniques at Beaverlodge. Wages and salaries totalled \$5,669,325. Company contributions to Pension, Employee Group Insurance and Welfare funds amounted to \$326,369.

The following table shows the number and distribution of employees at the year-end:

	Hourly- rated Employees	Salaried Employees	Totals 1963	1962
Beaverlodge Operation	389	142	531	557
Port Hope Refinery	92	53	145	205
Research and Development	4	60	64	54
Edmonton Office	—	8	8	7
Head Office	—	28	28	25
Totals	485	291	776	848

There were a number of senior personnel changes during the year. R. E. Barrett resigned as manager of Ore Procurement at the end of June, and his duties have been

Continued on Page 20

Processing of enriched uranium at Port Hope Refinery entails meticulous filtration.



ELDORADO MINING AND REFINING LIMITED

Statement of Income and Expense

FOR THE YEAR ENDED DECEMBER 31, 1963

(with comparative figures for the year ended December 31, 1962)

	1963	1962
INCOME:		
Sales	\$ 24,280,962	\$ 26,695,497
EXPENSE:		
Mining, milling and refining	11,222,561	11,770,597
Depreciation	4,162,435	3,951,825
Amortization of cost of acquiring rights to deliver concentrates on cancellation of contract with another producer	3,468,113	3,233,650
Amortization of pre-production, mine development and other deferred expenditures	806,429	836,126
Scientific research	769,211	351,313
Grants in lieu of municipal taxes	277,658	288,649
Reduction in valuation of inventories	224,000	—
Sales expense	148,286	100,662
	<u>21,078,693</u>	<u>20,532,822</u>
NET INCOME FROM OPERATIONS	3,202,269	6,162,675
Income arising from the financing of ore procurement programme	1,254,629	263,956
Interest and other non-operating income (net)	1,225,990	1,383,723
	<u>5,682,888</u>	<u>7,810,354</u>
Provision for income tax	2,900,000	3,600,000
NET INCOME:	<u>\$ 2,782,888</u>	<u>\$ 4,210,354</u>

The accompanying notes are an integral part of the financial statements. (See page 14).

Eldorado Mining and Refining Limited

(Incorporated under the laws of the Republic of South Africa)

BALANCE SHEET

at December 31, 1963

(with comparative figures for 1962)

ASSETS	1963	1962
CURRENT ASSETS:		
Cash	\$ 244,387	\$ 628,208
Deposit with Receiver General	13,200,000	13,200,000
Treasury bills and short-term bank deposits	6,307,440	19,274,202
Accounts receivable	3,309,361	3,053,711
Advances in respect of concentrates to be received	244,685	16,838,721
Concentrates and refinery products valued at lower of cost or realizable value	12,998,342	15,742,929
Operating and general supplies, at cost	2,752,666	3,039,701
Prepaid expenses	121,634	130,121
	<u>39,178,515</u>	<u>71,907,593</u>
Advances in respect of concentrates to be received in later years	34,990,918	24,180,913
Deferred account receivable in respect of concentrates delivered (Note 1)	20,879,580	3,988,178
	<u>55,870,498</u>	<u>28,169,091</u>
INVESTMENTS AND LOANS:		
Investments in wholly-owned subsidiary companies, at cost	187,153	187,153
Employees' housing loans	327,676	371,243
Municipal Corporation of Uranium City and District 5% debentures, maturing 1975 to 1979	871,973	914,514
	<u>1,386,802</u>	<u>1,472,910</u>
DEFERRED CHARGES:		
Unamortized pre-production, mine development and other expenditures	473,406	1,277,964
Unamortized cost of acquiring rights to deliver concentrates on cancellation of contract with another producer	3,121,382	6,589,496
	<u>3,594,788</u>	<u>7,867,460</u>
Excess of costs and expenses over sales of concentrates procured from other producers, recoverable before completion of contracts (Note 2)	2,989,607	1,788,367
CAPITAL ASSETS:		
Property, plant and equipment, at cost	50,329,305	49,955,307
Less: Accumulated depreciation	47,128,492	43,180,098
	<u>3,200,813</u>	<u>6,775,209</u>
	<u>\$ 106,221,023</u>	<u>\$ 117,980,630</u>

The accompanying notes are an integral part of the financial statements. (See page 14)

Approved on behalf of the Board

W. M. GILCHRIST,
Director.

J. E. SYDIE,
Director.

Refining Limited

(Incorporated under the Companies Act)

BALANCE SHEET

March 31, 1963

(as at December 31, 1962)

LIABILITIES		1963	1962
CURRENT LIABILITIES:			
Accounts payable	\$	5,390,954	\$ 6,012,189
Provision for income tax		1,721,400	2,654,977
Advance payments in respect of concentrates and other products to be delivered		9,943,593	28,167,710
		<u>17,055,947</u>	<u>36,834,876</u>
Advance payments in respect of concentrates to be delivered in later years		<u>38,114,122</u>	<u>30,877,688</u>
CAPITAL:			
Capital Stock:			
Authorized — 110,000 shares of no par value			
Issued — 70,500 shares, fully paid		6,586,080	6,586,080
Surplus		44,464,874	43,681,986
		<u>51,050,954</u>	<u>50,268,066</u>
		<u>\$ 106,221,023</u>	<u>\$ 117,980,630</u>

I have examined the above Balance Sheet and the related statement of Income and Expense and have reported thereon under date of March 2, 1964 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

ELDORADO MINING AND REFINING LIMITED

Notes to Financial Statements

1. Deferred Account Receivable

The contract with the United Kingdom Atomic Energy Authority for the sale of 12,000 tons of uranium in concentrates provides for certain deliveries on which payments do not become due until later years of the contract period. The account receivable thus deferred at December 31, 1963 and amounting to \$20,879,580 will increase in subsequent years, reaching a maximum of almost \$32,000,000 in March 1965 and declining thereafter until it is fully paid at the end of the contract in 1973.

2. Excess of Costs and Expenses over Sales of Uranium Concentrates procured from other Producers

Concentrates are purchased by the company, as uranium procurement agent for the Crown, at various prices determined by separate agreements with each producer. In some cases the purchase prices are higher and in other cases lower, than the prices at which concentrates are sold to the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. Although all purchase costs will be fully recovered before the contracts are completed, there are periods within the life of the contracts when total costs of concentrates sold exceed total revenue from sales. During these periods, temporary financing is provided, as required, by the company. Charges are being applied against the contract revenue for the company's services in administering and financing the ore procurement programme.

At December 31, 1963 the excess of costs and expenses over sales of concentrates procured from other producers amounted to \$2,989,607, of which \$1,201,240 was incurred in the year under review. All such excess costs and expenses will be offset in subsequent periods when deliveries will be made at prices exceeding the costs of acquisition.

3. Claims

Claims aggregating approximately \$20,000,000 have been received by the company in respect of alleged breaches of contract. Officers and legal counsel of the company deny any liability whatsoever under these claims.

4. Government of Canada Stockpile Programme

During 1963 the Treasury Board with the approval of the Governor in Council, granted authority for the entry into contracts between Her Majesty the Queen in right of Canada, acting and represented by Eldorado Mining and Refining Limited, and certain Canadian uranium producers for the purchase by Her Majesty of uranium bearing concentrates.

At December 31, 1963 the company was the custodian of uranium concentrates to a total cost of \$6,342,372 thus acquired. The cost of these concentrates was charged to Department of Trade and Commerce Vote L 63c, Appropriation Act No. 5, 1963 and was not included in the accounts of the company.

5. Supplementary Information

Included in expenses for 1963 are: directors' fees, \$6,000; legal fees, \$7,545; and remuneration of executive officers, \$144,500.

ELDORADO MINING AND REFINING LIMITED

Statement of Sales and Costs of Uranium Concentrates Procured from other Producers

for the year ended December 31, 1963

(with comparative figures for the year ended December 31, 1962)

	1963	1962
Sales under contract with:		
United States Atomic Energy Commission	\$ 80,880,570	\$133,780,751
United Kingdom Atomic Energy Authority	37,726,921	18,183,255
	<u>118,607,491</u>	<u>151,964,006</u>
Costs of concentrates sold	118,487,027	153,444,162
Excess of Sales over Costs	<u>120,464</u>	<u>(1,480,156)</u>
Administrative expenses	67,075	44,255
Financial charges	1,254,629	263,956
	<u>1,321,704</u>	<u>308,211</u>
Excess of costs and expenses over sales of concentrates procured from other pro- ducers, recoverable before completion of contracts (Note 2)	\$ 1,201,240	\$ 1,788,367

The accompanying notes are an integral part of the financial statements.

ELDORADO MINING AND REFINING LIMITED

Statement of Surplus

for the year ended December 31, 1963

(with comparative figures for the year ended December 31, 1962)

	1963	1962
Balance at beginning of year	\$43,681,986	\$42,471,632
Net profit for year	<u>2,782,888</u>	<u>4,210,354</u>
	46,464,874	46,681,986
Dividend	<u>2,000,000</u>	<u>3,000,000</u>
Balance at end of year	<u>\$44,464,874</u>	<u>\$43,681,986</u>

AUDITOR GENERAL OF CANADA

Ottawa, March 2, 1964

The Honourable MITCHELL SHARP,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Eldorado Mining and Refining Limited for the year ended December 31, 1963. In compliance with the requirements of section 87 of the Financial Administration Act, I report that, in my opinion:

- a) proper books of account have been kept by the company;
- b) the financial statements of the company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of income and expense, give a true and fair view of the income and expense of the company for the financial year; and
- c) the transactions of the company that have come under my notice have been within the powers of the company under the Financial Administration Act and any other Act applicable to the company.

In accordance with the requirements of Section 118 of the Companies Act, R.S. 1952, I report that the profit for the year of Northern Transportation Company Limited, a wholly-owned subsidiary, has not been included in the accounts of Eldorado Mining and Refining Limited. The net expenses of Eldorado Aviation Limited, another wholly-owned subsidiary, were recovered from Eldorado Mining and Refining Limited and Northern Transportation Company Limited as at December 31, 1963.

Yours faithfully,

A. M. HENDERSON.

Auditor General of Canada.

NORTHERN TRANSPORTATION COMPANY LIMITED

(Incorporated under The Companies Act)

Balance Sheet

at December 31, 1963

(with comparative figures at December 31, 1962)

ASSETS

	1963	1962
CURRENT ASSETS:		
Cash	\$ 254,312	\$ 247,095
Short-term bank deposits ..	3,200,000	2,920,506
Accounts receivable	348,769	223,104
Operating and general supplies, at cost	338,169	339,998
Prepaid expenses	19,230	—
	<u>4,160,480</u>	<u>3,730,703</u>
Short-term Deposits held for Insurance Investment Fund	<u>1,250,000</u>	<u>1,250,000</u>
CAPITAL ASSETS, at cost:		
Land	89,442	82,971
Buildings, including equipment	2,310,676	2,290,236
Boats and barges, including equipment	9,470,132	8,961,094
Automotive equipment	1,043,988	1,032,516
Other	103,354	103,144
	<u>13,017,592</u>	<u>12,469,961</u>
Less: Accumulated depreciation	<u>11,533,938</u>	<u>10,990,621</u>
	<u>1,483,654</u>	<u>1,479,340</u>
	<u>\$ 6,894,134</u>	<u>\$ 6,460,043</u>

LIABILITIES

	1963	1962
CURRENT LIABILITIES:		
Accounts payable	\$ 234,608	\$ 150,450
Provision for income tax ..	228,720	150,277
	<u>463,328</u>	<u>300,727</u>
CAPITAL:		
Capital Stock:		
Authorized — 50,000 shares of no par value		
Issued — 1,520 shares, fully paid	152,000	152,000
Surplus	5,028,806	4,757,316
Reserve for insurance	1,250,000	1,250,000
	<u>6,430,806</u>	<u>6,159,316</u>
	<u>\$ 6,894,134</u>	<u>\$ 6,460,043</u>

Approved on behalf of the Board

W. M. GILCHRIST,

Director

W. J. BENNETT,

Director

I have examined the above Balance Sheet and the related Statement of Income and Expense and have reported thereon under date of March 2, 1964 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

NORTHERN TRANSPORTATION COMPANY LTD.

Statement of Income and Expense

for the year ended December 31, 1963

(with comparative figures for the year ended December 31, 1962)

INCOME	1963	1962
Freight earnings	\$ 2,809,322	\$ 2,233,491
EXPENSE		
Operations and maintenance:		
Salaries and wages	781,979	647,335
Depreciation	479,172	477,371
Repairs and maintenance	330,161	242,573
Fuels and lubricants	160,730	125,518
Messing expense	129,261	105,983
Truck and tractor maintenance	24,359	20,939
Insurance	19,656	24,205
Switching, demurrage and spur expense	13,057	21,765
Transportation of employees	24,243	22,644
Grants in lieu of municipal taxes	23,464	22,584
Pallet expense	14,108	10,527
Miscellaneous	26,842	21,200
	<u>2,027,032</u>	<u>1,742,644</u>
Administrative:		
Executive officers' salaries	43,287	40,701
Other salaries	72,817	73,778
Contributions to employees' pension plan	47,874	50,583
Depreciation	10,789	10,797
Miscellaneous (including directors' fees, \$550 and legal fees, \$513)	69,981	74,914
	<u>244,748</u>	<u>250,773</u>
	<u>2,271,780</u>	<u>1,993,417</u>
NET INCOME FROM OPERATIONS	537,542	240,074
Interest from investments	164,747	136,205
Profit on disposal of capital assets	7,921	6,240
	<u>710,210</u>	<u>382,519</u>
Provision for income tax	438,720	250,277
NET INCOME	<u>\$ 271,490</u>	<u>\$ 132,242</u>

NORTHERN TRANSPORTATION COMPANY LTD.

Statement of Surplus

for the year ended December 31, 1963

(with comparative figures for the year ended December 31, 1962)

	1963	1962
Balance at beginning of year	\$ 4,757,316	\$ 5,375,074
Transfer to Reserve for Insurance		750,000
		<u>4,625,074</u>
Net income for year	271,490	132,242
Balance at end of year	<u>\$ 5,028,806</u>	<u>\$ 4,757,316</u>

AUDITOR GENERAL OF CANADA

Ottawa, March 2, 1964

The Honourable MITCHELL SHARP,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Northern Transportation Company Limited for the year ended December 31, 1963. In compliance with the requirements of section 87 of the Financial Administration Act, I report that, in my opinion:

- a) proper books of account have been kept by the company;
- b) the financial statements of the company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of income and expense, give a true and fair view of the income and expense of the company for the financial year; and

- c) the transactions of the company that have come under my notice have been within the powers of the company under the Financial Administration Act and any other Act applicable to the company.

Yours faithfully,

A. M. HENDERSON.

Auditor General of Canada.

ELDORADO AVIATION LIMITED

(Incorporated under the Companies Act)

Balance Sheet

at December 31, 1963

(with comparative figures at December 31, 1962)

ASSETS			
	1963	1962	
CURRENT ASSETS:			
Cash	\$ 35,227	\$ 23,991	
Accounts receivable:			
Eldorado Mining and Refining Limited	61,758	—	
Northern Transportation Company Limited	7,555	26,790	
Other	1,074	1,913	
	<u>70,387</u>	<u>28,703</u>	
Operating supplies, at cost ..	63,458	53,306	
Prepaid insurance	16,344	24,812	
	<u>185,416</u>	<u>130,812</u>	
CAPITAL ASSETS, at cost:			
Aircraft, including major spare parts	945,018	873,750	
Building	—	32,426	
Shop, hangar and loading equipment, etc.	34,508	34,138	
Office furniture and equipment	7,873	7,873	
	<u>987,399</u>	<u>948,187</u>	
Less: Accumulated depreciation	823,185	793,116	
	<u>164,214</u>	<u>155,071</u>	
	<u>\$ 349,630</u>	<u>\$ 285,883</u>	

LIABILITIES			
	1963	1962	
CURRENT LIABILITIES:			
Accounts payable:			
Trade	\$ 93,941	\$ 29,062	
Eldorado Mining and Refining Limited	—	1,132	
	<u>93,941</u>	<u>30,194</u>	
CAPITAL:			
Capital Stock:			
Authorized—50,000 shares of \$1 each			
Issued—28,006 shares, fully paid	28,006	28,006	
Surplus	127,683	227,683	
Reserve for uninsured losses	100,000	—	
	<u>255,689</u>	<u>255,689</u>	
	<u>\$ 349,630</u>	<u>\$ 285,883</u>	

Approved on behalf of the Board

W. M. GILCHRIST,
Director

W. J. BENNETT,
Director

I have examined the above Balance Sheet and the related Statement of Recoverable Expenses and have reported thereon under date of March 2, 1964 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

ELDORADO AVIATION LIMITED

Statement of Recoverable Expenses

for the year ended December 31, 1963
(with comparative figures for the year ended December 31, 1962)

	1963	1962
Salaries, wages and contributions to employees' pension plan	\$ 186,999	\$ 250,658
Supplies	153,359	134,370
Depreciation	48,953	59,060
Repairs	166,784	81,500
Insurance	35,156	49,900
Hangar expense	44,159	32,175
Landing fees and radio maintenance	14,508	13,583
Travel	4,019	5,407
Miscellaneous	22,649	12,528
	<u>676,586</u>	<u>639,181</u>
Less: Miscellaneous income	5,098	29,842
Net Expenses	<u>\$ 671,488</u>	<u>609,339</u>

Note: The above net expenses were recovered from:

Eldorado Mining and Refining Limited	533,417	494,449
Northern Transportation Company Limited ..	138,071	114,890
	<u>\$ 671,488</u>	<u>\$ 609,339</u>

AUDITOR GENERAL OF CANADA

Ottawa, March 2, 1964

The Honourable MITCHELL SHARP,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Eldorado Aviation Limited for the year ended December 31, 1963. In compliance with the requirements of section 87 of the Financial Administration Act, I report that, in my opinion:

- a) proper books of account have been kept by the company;
- b) the financial statements of the company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of recoverable expenses, give a true and fair view of the expenses of the company for the financial year; and
- c) the transactions of the company that have come under my notice have been within the powers of the company under the Financial Administration Act and any other Act applicable to the company.

Yours faithfully,

A. M. HENDERSON.
Auditor General of Canada.



Helicopters and radar have replaced the man in the crow's nest in marine navigation on the Arctic Ocean. When Northern Transportation Limited made a pioneering voyage last Summer to deliver 3,000 tons of oil rig and equipment to a site on the Colville River, on the Alaska coast, a helicopter scouted ice conditions ahead.

Continuation of General Report from Page 10

assumed by D. D. Bell, staff engineer. J. M. Douglas, manager of the Beaverlodge Operation, left the Company May 31 and was succeeded by A. R. Allen, who had been general superintendent at Beaverlodge since April, 1961. Mr. Allen's successor as general superintendent is J. F. Dunnett, formerly mine superintendent.

Northern Transportation Company Limited

Revenue, profit and tonnage handled all showed increases in 1963, and the year's operation of Northern Transportation Company Limited exceeded expectations. Freight revenue was up 26 per cent, amounting to \$2,809,322 as against \$2,233,491 in 1962. Profit after taxes increased from \$132,242 in 1962 to \$271,490 in 1963.

Federal income taxes paid or provided for since 1952, when the Company first became liable under the provisions of the Income Tax Act, have amounted to \$2,935,000. Grants in lieu of municipal property taxes have aggregated \$281,600 over the years and additional substantial amounts have been paid as sales tax and other indirect taxes.

Freight tonnage carried rose from 113,598 tons in 1962 to 119,616 tons in 1963, whereas estimates a year ago had contemplated a small reduction because of the diminishing operation of Gunnar Mining Limited. That company's needs were greater than had been anticipated. In addition, Northern Transportation was called upon to move an oil company drill rig into the Colville River on the Alaska coast, involving about 3,000 tons of freight.

Northern Transportation, at the request of The Hudson's Bay Company, took over the Arctic freight service formerly provided by that organization, and satisfac-

torily completed all commitments for the season. Ice conditions in the Arctic were favourable, although some delays were caused by wind. The DEW Line re-supply was again completed successfully, and during the year two vessels formerly available for this service were returned to the United States Navy at Seattle.

A total of 440 employees were on the payroll at the peak of the season, of whom 149 were engaged in the DEW Line re-supply operation. Wages and salaries, including the DEW Line, amounted to \$1,528,229. Company contributions to the Pension and Welfare plans totalled \$78,640.

Eldorado Aviation Limited

Aircraft of Eldorado Aviation Limited flew more miles and carried more tonnage in 1963 than in 1962. A total of 2,751,639 ton-miles was flown in 1963, an increase of 153,116 ton-miles. Total cost of the operation of three transport aircraft was \$589,107, a ton-mile cost of 21.4 cents, as against \$581,172 and 22.3 cents in 1962. The Company's 17-year average cost per ton-mile is 20.6 cents.

Eldorado Aviation's DC-4 transport was taken out of service in December for major overhaul, and service was maintained by two DC-3's. Two Bell helicopters were used as needed for the Northern Transportation Company DEW Line re-supply service during the Summer, and were later returned to Beaverlodge area. The Sikorsky S-55 helicopter was in use for only a short period, on forest fire suppression work.

Wages and salaries paid during 1963 amounted to \$233,916 and Company contributions to the Pension and Welfare plans totalled \$21,120.

The History of Eldorado and its Subsidiary Companies

The names "Eldorado" and "Northern" have been closely identified with the development of the Canadian Northland since the early 1930's.

It was in 1930 that Eldorado Gold Mines Limited, the forerunner of Eldorado Mining and Refining Limited, staked its claims for what was to become the famous Port Radium Mine on the shore of Great Bear Lake, the foundation mine of the Canadian uranium industry.

In 1931 two Edmonton businessmen founded Northern Waterways Limited. It was to become Northern Transportation Company Limited, which now provides water transportation throughout the vast Mackenzie Watershed.

The mining operations of Eldorado, and the shipping services of Northern, have made important economic and social contributions in the development of the sparsely populated, but potentially rich region which comprises about one-third the total area of Canada.

The Story of Eldorado

The true beginning lay in a few sentences of a Government report, written in 1900, which occasioned so little interest that it gathered dust in the files for at least a quarter-century.

Long before the airplane and the helicopter had been thought of, the Geographical Survey of Canada sent intrepid geologists to scour the virtually unexplored Northwest Territories, on foot and by canoe, in an effort to determine some of its mineral potentials. One of these geologists, J. Macintosh Bell, concentrated his search along the shores of Great Bear Lake. This 12,000-square-mile body of fresh water, much larger than either Lake Ontario or Lake Erie, lies east of the Mackenzie River and is partly within, although mainly below, the Arctic Circle.

What Uranium Has Meant to Canada

Sales of uranium to the United States and the United Kingdom in the period 1955-63 inclusive brought an average of \$175,000,000 annually into the Canadian economy. By the time deliveries have been completed under existing contracts, the total value of sales will be close to \$1,750,000,000.

The geologist reported that he had found "rock stained with cobalt bloom and copper green" on the eastern shore of the lake. He added, almost as an after-thought, that there might be deposits of pitchblende, the mother ore of radium and uranium.

Stirred Little Interest

In 1900 radium and uranium were still laboratory curiosities. A German chemist, Klaproth, had discovered the element uranium, as well as zirconium and titanium, in 1789. More than a century later Henri Becquerel of France published his observations of the radio-activity of uranium, pointing the way for the Curies, who discovered radium and its transformation product, polonium, in 1898.

Applications in medical therapy, and in some industrial uses such as luminous paint, gradually created a demand for radium. The Shinkolobwe mine in the Belgian Congo had a virtual world monopoly and at one time a single gram of the element was worth \$70,000 or more.

On the other hand, there was relatively small demand for uranium. Some of the compounds were used in the arts and industry as coloring materials for ceramics, as chemical reagents, and in a variety of alloys, but the quantities involved were not great. It is of interest that a patent was issued in France as early as 1897 for an alloy of uranium with steel. In World War I the Germans lined the barrel of "Big Bertha" with uranium steel. The giant railway gun was used to hurl scores of 200-pound shells into Paris from an incredible range of 75 to 80 miles.

The Port Radium Discovery

Late in the 1920's Eldorado Gold Mining Limited decided to undertake aerial prospecting in the Far North, and preliminary studies brought the Bell report to light. A search along the eastern shore of Great Bear Lake confirmed not only indications of silver and cobalt, but the presence of pitchblende in substantial quantities. Claims were staked and development of the mine was begun as quickly as equipment could be brought in, virtually all of it by air-lift in the relatively small aircraft available at the time. Initially, mining operations were directed mainly towards the silver, cobalt and gold values in the ore, but it was soon apparent the real wealth of the mine lay in the pitchblende.

A small refinery was established at Port Hope, Ontario, almost 3,000 miles from the mine itself. Shipping of concentrates by air, water and rail began in 1932. The refinery made its first shipment of Canadian-produced radium in 1933. In November, 1936, it completed pro-

duction of its first ounce (28 grams) of radium, and by 1938 a monthly output of 2.5 grams was reported. The actual product of the refinery was radium bromide of 90 per cent purity, which was shipped to England for accurate determination of radio-active content, final refinement, and preparation into usable form.

Even though the amounts involved seem relatively minute, the rising Canadian production broke the Belgian monopoly and the price of radium dropped rapidly. In 1940 demand had diminished, substantial inventories were on hand, and Eldorado closed the Port Radium mine.

Concurrent with the production of radium through the 1930's, Eldorado had sold substantial quantities of silver from the mine and had developed a small market for such uranium salts as yellow and orange sodium uranate and black oxide, mainly for use in the colouring of glass and ceramics. The price of these salts ranged from \$2.50 to \$2.92 per pound in 1938.

First Atomic Use of Uranium

An urgent need for uranium in quantity arose with the inception in 1942 of the Manhattan Project, the joint British-United States-Canadian undertaking which eventually brought forth the atomic bomb. Canada's chief role was to supply the uranium raw material, and the Government requested the re-opening of the Port Radium mine on an emergent basis, but with no hint as to the reason. The mine and mill, as well as the Port Hope refinery, were in full operation by early 1943. Shipments of uranium were made, but it is believed the actual material used for the first atomic bomb was not of Canadian origin.

In June, 1943, the Company name was changed from Eldorado Gold Mines Limited to Eldorado Mining and Refining Limited. Late in that year, when it became evident the atomic bomb would be feasible, the three governments concerned decided that they should at once gain complete control of uranium resources within their respective territories. On January 28, 1944, Eldorado was expropriated and the operation was taken over by the Crown-owned Eldorado Mining and Refining (1944) Limited. Northern Transportation Company Limited was taken over at the same time.

The Port Radium mine was exceedingly rich, but eventually its ore gave out and it ceased operations and was placed on a caretaker basis in September, 1960. Meanwhile, Eldorado prospectors had found important ore deposits in the Lake Athabaska region, leading to development of the Beaverlodge mine which went into production in 1953.

The Boom Years for Uranium

Eldorado was the sole producer of uranium in Canada until cold war demands created new and urgent demands which led to the discovery and development of further deposits of ore, especially in the Blind River (Elliot

Lake) and Bancroft areas of Ontario and the Beaverlodge region of Northwestern Saskatchewan. By 1958 there were 25 producing mines in Canada, and the peak production of almost 31,000,000 pounds of U_3O_8 was attained the following year.

The amount of uranium provided by Eldorado for military purposes during World War II and up to incorporation of the Crown corporation in 1944 is still classified information. However, the Company's revenue from 1944 to the end of 1954, from the sale of uranium and from some sales and rentals of radium, was about \$82,000,000. Its income from uranium sales in the period 1955-63 inclusive was \$234,279,000 and, in the same term, its revenue from operation of the refinery amounted to \$33,165,000. The Company's aggregate income from 1944 to the end of 1963 was just over \$349,000,000, representing a little better than one dollar of every five Canada has earned to date from the sale of uranium.

The Government's original investment in acquiring ownership of Eldorado Mining and Refining Limited was \$9,246,877, from which it has derived a return of \$30,740,000 in dividends and redemption of shares. From 1944 to date the Company has paid, or provided for, in federal taxes, provincial royalties, and grants in lieu of municipal taxes, a total of \$32,890,000. The net worth of the Company at the end of 1963 was about \$51,000,000.

Eldorado has two wholly-owned subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited.

The History of Northern Transportation Company

In 1931 two Edmonton businessmen, C. Becker and C. Murdoff, set up Northern Waterways Limited as a common carrier between Waterways, Alberta, and Aklavik, N.W.T., with initial equipment of one wooden vessel and two barges. In 1933 service was extended into Bear River and Great Bear Lake to meet the needs of the Port Radium mine. The company changed hands in 1934 and the name was changed to Northern Transportation Company Limited.

Eldorado Gold Mines Limited acquired Northern Transportation Company Limited in 1936, primarily to assure continuing and adequate service to its mine, but operation as a common carrier also was maintained. The fleet was enlarged and modernized.

Initiation of the Canol Project in 1941, and re-opening of the Port Radium mine in 1942, brought all Northern Transportation Co. equipment into service for the duration of the war. When the Canol Project was abandoned in 1944, NTCL contracted to bring out 25,000 tons of equipment and materials.

In 1946 all transportation on the Mackenzie system was brought under Board of Transport Commissioners' regulations. When Hudson's Bay Transport discontinued

Canada's Uranium Sales 1955-1963

to the United States Atomic Energy Commission and
the United Kingdom Atomic Energy Authority

POUNDS U₃O₈ SOLD

DOLLAR VALUE OF SALES

	<i>Industry Total</i>	<i>Eldorado</i>	<i>Other Producers</i>	<i>Total</i>
1955	2,030,767	\$ 23,687,582	\$ 1,190,547	\$ 24,878,129
1956	4,223,704	21,511,508	20,785,781	42,297,289
1957	12,152,916	26,554,646	98,985,240	125,539,886
1958	26,796,084	33,010,520	246,904,045	279,914,565
1959	30,996,065	29,998,052	295,330,230	325,328,282
1960	24,960,435	31,720,083	234,037,824	265,757,907
1961	19,270,884	24,786,036	177,544,698	202,330,734
1962	17,080,037	21,718,388	151,964,007	173,682,395
1963	15,216,812	21,292,683	118,607,491	139,900,174
	<u>152,727,704</u>	<u>\$234,279,498</u>	<u>\$1,345,349,863</u>	<u>\$1,579,629,361</u>

operations as a common carrier at the end of the 1947 season, NTCL added vessels to handle the additional freight. In 1949, at the request of the R.C.A.F., NTCL operated the "Snowbird" between Tuktoyaktuk and Cambridge Bay in the Western Arctic.

Serving DEW Line in Arctic

The Radium Dew and three steel barges were built especially for delivery of construction materials and equipment for six DEW Line sites in the Mackenzie Delta, beginning in 1955. In 1958 Northern Transportation began re-supply of 25 DEW Line sites along the Arctic Coast, operating LST's and tankers made available under a loan agreement between the United States and Canadian governments.

When uranium mines around Lake Athabaska were coming into the development and production stage in 1956, NTCL bought three new vessels and 27 steel barges to take care of the heavy increase of freight. Some of this equipment "went into mothballs" in 1960 when freight volume declined because of the cut-back in uranium production. Five mines in the Beaverlodge region, as well as the Port Radium mine on Great Bear Lake, were shut down in that year.

In 1963, at the request of The Hudson's Bay Company, NTCL took over the Arctic freight service formerly

provided by that organization, and completed all commitments for the season.

Northern A Tax-payer, Too

Although under Crown ownership, Northern Transportation operates under the same regulations and pays the same taxes as private companies. It has shown a net profit after tax in 17 of the 19 years since it was acquired by the Crown (as a wholly-owned subsidiary of Eldorado), and other than for initial capital investment when it was taken over, has paid for the expansion of its facilities out of its own earnings.

Federal taxes paid by NTCL, or provided for, since 1952, when it first became liable under the provisions of the Income Tax Act, have amounted to \$2,935,000. Grants in lieu of municipal taxes have aggregated \$281,600.

When the Company was acquired by the Crown in 1944, its fleet of wooden tugs and barges was bought at a cost of \$140,000. Today the Company has 25 Diesel-powered steel tugs and 98 steel barges, which, together with shipyards, agency facilities and equipment, represent an investment of more than \$12,000,000.

NTCL serves an area extending from railhead at Waterways, Alberta, to Tuktoyaktuk on the Arctic Coast, a distance of 1,700 miles, with an additional 1,100 miles of branch routes to the principal lakes, Athabaska,

Great Slave and Great Bear. In addition, NTCL operates a freight service in the Western Arctic and is the Government agency responsible for re-supply of the DEW Line radar stations.

History of Eldorado Aviation

The remoteness of the Port Radium mine made air transportation essential from the earliest stages. In 1944 Eldorado acquired its own aircraft to assist in field exploration work and the movement of personnel, perishable goods and emergency supplies. The service was expanded and a regular schedule established with the inception of the Beaverlodge mine, and in 1953 the division was incorporated as a separate, wholly-owned subsidiary company, Eldorado Aviation Limited. It provides air service at cost for Eldorado and Northern Transportation Company Limited. In addition to the movement of personnel and supplies, the aircraft carry uranium concentrates out of Beaverlodge.

From the formation of Eldorado Aviation in May, 1944, until the end of 1963, its aircraft had flown more than 12,800,000 miles, in excess of 65,000 flying hours, and had carried more than 71,000 tons of freight and 97,000 passengers.

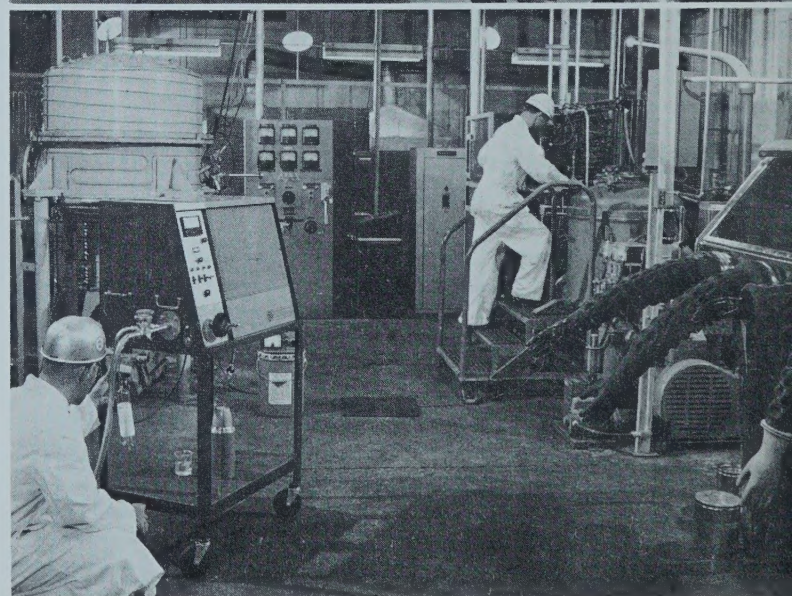
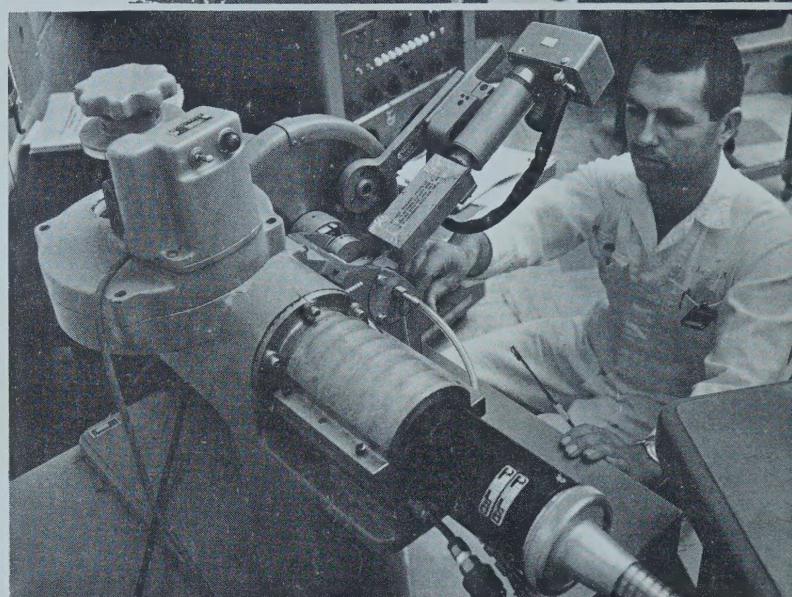
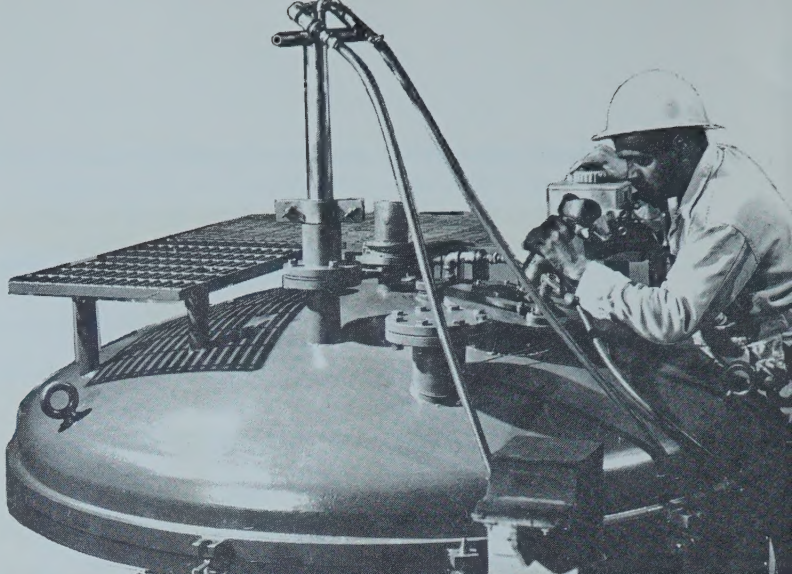
Eldorado Products and Services

Eldorado Mining and Refining Limited is recognized as the foremost fully-integrated uranium company in the Free World. It operates a rich mine in the Beaverlodge region of Saskatchewan; operates Canada's only uranium refinery at Port Hope, Ontario; carries on an extensive program of research, and maintains a sales and service organization.

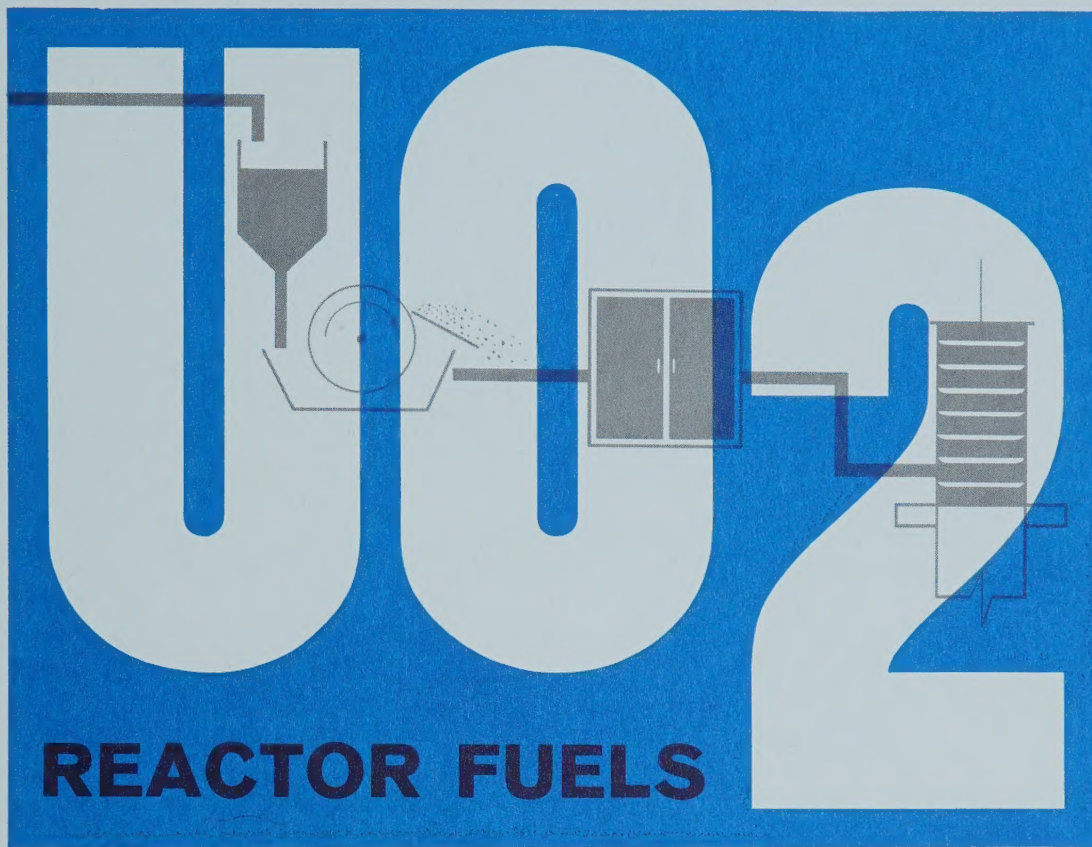
The Company has been engaged in mining and refining uranium for more than 30 years, and has acquired not only a wealth of highly specialized knowledge and experience, but the organization and facilities to meet almost any challenge in its field. The range of its products is steadily expanding, and it is the aim of the Company to continue to meet the needs of industry with new products and materials.

The emphasis recently has been on the development and production of new and varied types of uranium fuels designed for the economic generation of energy. These include ceramic type uranium dioxide, uranium carbide, uranium metal and its alloys—all in natural, depleted or enriched forms. Physically they range from powders through agglomerates, pellets, and cast or machined shapes, according to customers' specifications. Aside from nuclear applications, uranium is finding increased applications elsewhere in industry and special, high-density alloys are being produced by Eldorado for a variety of uses.

The Company is in a position to undertake custom refining, scrap re-treatment and custom analysis, and invites inquiries regarding such services.



Quality and purity are the watchwords at every stage in the production of Eldorado's Refinery. (TOP) Checking temperatures of melt in the electric vacuum furnace, largest of its kind in Canada. (CENTRE) X-ray diffraction studies and spectrometer analyses are used for research and quality control. (LOWER) Development area for uranium carbide and alloys, shows two vacuum furnaces, "dry box" and a leak detector.



consistently uniform — nuclear purity guaranteed

Throughout the world, in a variety of operating reactors, Eldorado fuels are proving their unexcelled quality. This excellence is the result of over thirty years experience in the handling of uranium combined with highly trained personnel and the most efficient facilities available.

Ceramic type UO_2 from Eldorado has several guaranteed physical properties in addition to its complete dependability as a consistently uniform, nuclear pure, Uranium Dioxide. Enriched UO_2 , prepared by the conversion of UF_6 , possesses the identical physical

characteristics as the natural uranium product. Acclaimed for its pressing and sintering properties by many users no binder is ever required for its conversion to sintered pellets. Customers experience fewer pellet rejects, a reduction of waste and the assurance of a steady manufacturing operation.

Other features include:

Particle Size	0.5 microns
Surface Area	9.5 m ² /g by BET
Green Density	5.3 g/cc at 20TSI
Sintered Density	10.6 g/cc at 1650°C

RAW MATERIALS REFINED PRODUCTS

Fabricated nuclear fuels — natural, enriched, depleted
Nuclear pure oxides — powder, pellets or fused
Nuclear pure metal-alloys — cast, rolled, machined
Finished fuel elements
Custom refining • Custom analysis

For detailed product information, sales and service write:

ELDORADO

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Advertisements such as this appear in the highly specialized publications serving the nuclear field in North America and overseas, and yield many inquiries about the products and services of Eldorado Mining and Refining Limited.

PRINTED IN CANADA BY
RICHARD'S PRINTING LTD.
PORT HOPE, ONTARIO